

PATENT
Docket No. H 1215/1556 PCT/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re: Application of Kluth et al.

Confirmation No. 6917

Serial No. 08/702,625

Examiner: J. Cooney

Filed: 8/23/96

Art Unit: 1711

Title: FOAM PLASTIC FROM DISPOSABLE PRESSURIZED CONTAINERS

BRIEF ON APPEAL

Mail Stop Appeal Brief
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellants herewith submit a Brief on Appeal from the EXAMINER'S FINAL REJECTION of claims 15-36 and 40-68, dated May 31, 2006.

**Serial No. 08/702,625
Art Unit: 1711**

TABLE OF CONTENTS

	Page
REAL PARTY IN INTEREST	3
RELATED APPEALS AND INTERFERENCES.....	4
STATUS OF CLAIMS	5
STATUS OF AMENDMENTS	6
SUMMARY OF CLAIMED SUBJECT MATTER.....	7
GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.....	10
ARGUMENT	11
CLAIMS APPENDIX	39
EVIDENCE APPENDIX	48
RELATED PROCEEDINGS APPENDIX.....	49

Serial No. 08/702,625

Art Unit: 1711

REAL PARTY IN INTEREST

The application is assigned to Henkel KGaA, Henkelstrasse 67, 40589

Duesseldorf, Germany.

**Serial No. 08/702,625
Art Unit: 1711**

RELATED APPEALS AND INTERFERENCES

Appellants are not aware of any appeals or interferences, which will directly affect or be directly affected by or have a bearing on the Board's decision in the present appeal.

Serial No. 08/702,625
Art Unit: 1711

STATUS OF CLAIMS

Claims 15-36 and 40-68 are pending in the application. Claims 1-14, 37,38 and 39 have been cancelled. All of the claims stand rejected under 35 U.S.C. § 103(a) over U.S. Patent 4,263,412 (Pauls) in view of CA-2, 084,698 (Schmalstieg et al: hereafter, Canada) and U.S. Patent 5,086,175 (Minato et al.). All of the pending claims are the subject of this appeal.

Serial No. 08/702,625
Art Unit: 1711

STATUS OF AMENDMENTS

No amendments have been submitted after Final Rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

The invention is a system for production of a plastic foam, uses for the plastic foam, compositions for forming the plastic foam, the composition to be foamed is accommodated in disposable pressurized containers, methods of use of the plastic foam, foam compositions and, a method for producing the system (page 1 of the application). The system of the invention provides considerably reduced emissions of diphenylmethane diisocyanate (monomer) during the processing (page 3 line 16-19).

The system of the invention provides a container that, within 24 hours after releasing the foam from the container, has a content of diisocyanate monomer of less than 5% by weight (original claim 1), preferably less 2% by weight based on the residual contents of the pressurized container, and preferably less than 0.5% (page 4, lines 13-16).

One solution for providing the container of the system with a low content of diisocyanate monomers is to provide a polymerizable composition which has a low content of diisocyanate monomers before the foaming reaction (page 4, lines 20, 21).

The result can also be achieved by the addition of a trimerization catalyst immediately before or after foaming or to add an OH containing compound to the composition remaining in the container after foaming (page 4, lines 24-28).

The composition necessarily contains at least one isocyanate prepolymer, at least one catalyst for the reaction of the isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer. In addition, other additives, for

example, solvents, flame proofing agents, plasticizers, cell regulators, and anti-agers may be added. (Page 4, line 29 to page 5, line 5).

Within the context of the invention, an "isocyanate prepolymer" is an oligomer containing reactive NCO groups which is involved as a pre-adduct in the formation of the polymer. (page 5 line 4-6.). Preferred prepolymers are formed by the reaction of isophorone diisocyanate or 2,4-tolylene diisocyanatotrimethylolpropane (page 5, lines 25-30). Polymer MDI which has a functionality of more than 2.3 and preferably in the range of 2.4 to 2.7 is useful in the practice of the invention (page 9 lines 1-9). The reactive isocyanate-containing compounds based on MDI are characterized by a diisocyanate content of less than 20% by weight preferably less than 5% by weight, an NCO functionality of 2.7 to 5, and an NCO content of 26.0 to 30.0% by weight (page 11 lines 13-21).

Other polyisocyanates and isocyanate prepolymers are characterized by an isocyanate monomer content of less than 3% by weight, more particularly, less than 1.0% by weight and most preferably less than 0.5% by weight, an NCO functionality of 2 to 5 and an NCO content of 8 to 30% by weight (page 11 lines 22-28).

The pressurized containers of the system of the invention contain 50 to 90 and preferably 60 to 85% by weight of an isocyanate containing compound, 0.1 to 5% by weight of catalyst, 5 to 35 and preferably 10 to 25% by weight of a blowing agent and 0.1 to 5% and preferably 0.5 to 3% of a foam stabilizer and up to 20 and preferably 3 to 15% by weight of a plasticizer. (Page 11 line 26 thru page 13 line 2). The composition

Serial No. 08/702,625

Art Unit: 1207

can contain optional materials such as flame proofing agents in the amount of 2 to 50% by weight; other optional additives in an amount of 0.1 to 3% by weight can be in the composition (page 13 lines 3-5).

Example 1 presents a composition containing isocyanate prepolymers formed by reaction of a cyclotrimer with ethylene glycol. Examples 2-9 present compositions containing cyclotrimers of isophorone diisocyanate and hexane diisocyanate. The formation of low diisocyanate content polymer methylenediphenylisocyanate (Polymer MDI) by removal of diisocyanate and monoisocyanate components from a mixture is shown (Example 10), and foaming compositions containing the polymer MDI (10a, 10b and 10c) and a comparative example (10c) are shown. The foaming compositions are single component foaming compositions. (Pages 15-20).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Does a reference (Pauls) which discloses a container for dispensing a foamed isocyanate composition containing more than 5% monomer, from which virtually all of the prepolymer is expelled, in combination with references (Canada; Minato et al.) which disclose an isocyanate prepolymer formed from a diisocyanate monomer and a hydroxy compound with a diisocyanate content below 2% by weight and an NCO group content above 8% by weight provide a prima facie case of obviousness:

2. Does a combination of references which discloses a system for dispensing a foam containing more than 5% by weight diisocyanate monomer (Pauls) in combination with references (Canada; Minato et al.) which disclose isocyanate mixtures containing less than 5% by weight diisocyanate monomers for use in non-foam applications provide a prima facie case of obviousness?

3. Is the combination of references proper?

ARGUMENT

The invention is a system for the production of plastic foam. The system comprises: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or polyisocyanate prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of plastic foam from the disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5% by weight, based on the residual contents of the emptied container. The system also can include a polyisocyanate or isocyanate prepolymer with a diisocyanate monomer content less than 3% by weight based on the prepolymer, an NCO functionality of 2 to 5, and an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa · s at 25°C.

The low content of diisocyanate monomer in the container after the foam has been expelled can be achieved as follows:

1. Using low diisocyanate monomer content prepolymer which must contain 8-30% by weight NCO groups.
2. Introducing a trimerization catalyst into the pressurized container immediately before or after the contents are released from the container.
3. Introducing an OH containing compound into the pressurized container

Serial No. 08/702,625

Art Unit: 1207

immediately before or immediately after the contents are removed from the container.

4. Using a cyclotrimer with a low diisocyanate content as the prepolymer.
5. Using polymer MDI with a low diisocyanate content as the prepolymer.

The system of the invention comprises a disposable pressurized container which contains a composition having an NCO group content of from about 8 to 30% by weight, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer.

The polyisocyanate or polyisocyanate prepolymer must have an NCO content of from about 8 to about 30% by weight based on the weight of the prepolymer. The high NCO content is required to permit the foam composition to cure rapidly so that the foam does not collapse before the cell walls are stabilized to an extent required to support the foam.

The container must also contain at least one catalyst for the reaction of the isocyanate group with an OH group. This is required to permit the foam to polymerize at a rate sufficiently high to stabilize the walls of the foam cells before the foam collapses.

The system of the invention also requires the presence of a blowing agent to form the foam when the contents of the container under pressure are released.

The composition of the present invention must also contain a foam stabilizer, which provides a foam with the required cell size.

All of the components must be present in the composition for it to effectively

Serial No. 08/702,625

Art Unit: 1207

function as a system for producing a foam. Other optional ingredients can be incorporated in the composition but the polyisocyanate or isocyanate prepolymer having an NCO content of from about 8 to about 30% by weight of the prepolymer, the catalyst, blowing agent and foam stabilizer are critical to the composition. Appellants submit that the prior art cited by the Examiner neither teaches nor suggests the present invention.

The claims stand rejected under 35 U.S.C. §103(a) as obvious over Pauls. (U.S. 4,263,412) in view of Schmalstieg et al. (CA 2084698; herein after noted as Canada) and Minato et al. (U.S. 5,086,175). Appellants respectfully submit that the references whether considered alone or in combination neither teach nor suggest the present invention.

DOES THE COMBINATION OF OF PAULS WITH CANADA AND MINATO ET AL..
PROVIDE A PRIMA FACIE CASE OF OBVIOUSNESS?

Pauls is related to the prior art disclosed by applicants. Pauls discloses a system for dispensing one component polyurethane foam from a container in which the foaming components are separated by a flexible membrane from the propelling gas. The device has the advantage that only a small amount of the foaming agent is required. The small amount of foaming agent permits selection from a broader range of foaming agents since certain useful foaming agents are soluble to only a limited extent in one component NCO containing foaming compositions. Pauls represents the prior art cited by appellants.

Pauls teaches that the components which react to form the isocyanate

Serial No. 08/702,625

Art Unit: 1207

containing reactants of the mixture are introduced into the container and reacted therein (see examples 1 to 7, column 7 lines 54, 55 and column 8 lines 25-29). A less preferred method is to react the isocyanate forming components in a kettle and pack the reaction mixture from the kettle into the container. As is known in the prior art, since the ratio of NCO groups to OH groups in the mixture which forms the prepolymer is in a range from 4 to 8, the amount of unreacted diisocyanate monomer in the contents of the container is high (greater than 5% by weight of the isocyanate component).

Pauls does not contain an explicit statement concerning the amount of MDI (diisocyanate monomer) in the foam forming composition in the pressurized container. However, from the examples, the content of unreacted MDI can easily be estimated from Examples 1-7 at columns 10 and 11. The estimates in the table below are based on the assumption that the mixture of MDI and poly MDI were the only materials present and the MDI - poly MDI mixture contained 53% MDI and 47%-poly MDI by weight (see Example 10 in the present application) and 31.5% NCO (Pauls).

Another assumption is that only the faster reacting MDI reacted which provides an estimate of the smallest amount of unreacted MDI remaining unreacted in the foaming composition.

TABLE

Example	1	2	3	4	5	6	7
Equivalents NCO Before Reaction	0.420	1.102	1.14	1.125	1.087	1.125	1.956
Equivalents OH Before Reaction	0.0705	0.176	0.1703	0.196	0.2095	0.2289	0.2091
NCO / OH	5.95	6.28	6.69	5.73	5.18	4.92	9.35
Percent Unreacted MDI After Reaction in the Foaming Mixture (only MDI Reacted))	20.28	19.7	18.93	20.18	19.6	19.8	24.14

Pauls represents the state of the art in regard to foam forming mixtures of isocyanates in pressurized containers before the present invention. The art considered the presence of large amount of diisocyanate monomer necessary to provide the rapid cure required to set the foam after it has been formed to prevent foam collapse.

The percent of MDI in the mixture shown in the Table represents the minimum amount of unreacted MDI in the mixture since the estimate is based on the assumption that only MDI reacted with the polyol.

The large amount of unreacted diisocyanate monomer in the contents of the Pauls container presents no problem; since at column 7, lines 61-65, Pauls teaches:

"The inner container (1), the special shape of which permits virtually complete expulsion of the foamable prepolymer mixture containing isocyanate groups, consists either of aluminum or a resilient plastic, e.g., high pressure polyethylene." (Emphasis added by appellants.)

Appellants submit that since the Pauls device permits virtually complete expulsion of the foamable prepolymer mixture containing diisocyanate monomer from the container, there is no incentive to reduce the content of diisocyanate monomer in the contents of the container to ease waste disposal. Since Pauls teaches that the preferred method of filling the container is by reacting the components in the container of the system or in a separate container then filling the system, which methods produce a foaming composition with a high concentration of diisocyanate monomer, applicants submit that Pauls is not concerned with the high concentration of monomer in the contents of the container since the container is virtually emptied due to its unique design and little monomer or prepolymer remains in the container after the foaming composition is expelled. There is no concern with a high monomer content in the foaming composition since little foaming composition remains in the container after use.

There is no suggestion in Pauls to use a low monomer content foaming composition or a composition which has a low monomer content after the system is emptied. In fact, Appellants submit that the prior art believed that substantial amounts of monomer were required in the foaming composition to provide the rapid reaction required to stabilize the foam.

The deficiencies in the teaching of Pauls are not cured by combination with Canada and Minato et al. Canada and Minato et al. disclose isocyanate-containing compositions having a low content of diisocyanate monomers which are useful for lacquers and adhesives. As set forth in the references, Canada and Minato et al. teach that a prepolymer is prepared using an excess of the diisocyanate monomer and the excess unreacted diisocyanate monomer is removed from the reaction mixture by a distillation process. The amount of unreacted diisocyanate monomer in the composition can be less than 0.1% by weight of the composition (see Canada, page 3, lines 9, 10). However, the composition with the low content of unreacted diisocyanate monomer is expensive to produce. One skilled in the art would have no incentive to include an expensive material in the formulation used in the container of Pauls. The Pauls container permits virtually complete expulsion of the foamable prepolymer mixture and therefore the empty container does not present a disposal problem.

The Canada reference is not pertinent to the present invention. The Canada polyisocyanate is a solid material and has a slow reaction rate which would make it difficult to produce an adequate foam which could be dispensed from the container only with difficulty. The isocyanate prepolymer or polymer must be a liquid material if the process of the present invention is to be operable. Appellants submit that the solid nature of the polyisocyanate of Canada would discourage its use in the system of the invention due to the large amount of solvent required. The composition of Canada is specifically developed to be soluble in certain solvents to be useful as a lacquer or

Serial No. 08/702,625

Art Unit: 1207

coating composition and to be slow reacting to have a long pot life. The large amount of solvent required in the Canada prepolymer would make it of little use in a foaming composite.

Nowhere in the teachings of Canada is there any suggestion that the polyisocyanate would be useful in a foaming application. The composition is particularly useful in a two component coating system due to its long pot life (slow curing). Canada discloses solid polyisocyanates which are useful in lacquer formulations. The polyisocyanates of Canada are generally dissolved in a large proportion of solvent. Since it is preferred that the system of the present invention is a one component system and does not contain a solvent, or only small amounts of solvent, Applicants submit that Canada neither teaches nor suggest the present invention.

As shown by the examples, the composition of Canada would not be useful as a one component foaming material due to its long drying time (13 hours). In addition, since the prepolymers are solids, and require large amounts of solvent, they would not be useful in the practice of the present invention.

Minato, et al. is not pertinent to the present invention. Minato et al. is directed to use of an isocyananate prepolymer which has been reacted to incorporate long chain alcohols (10-50 carbon atoms) in the prepolymer. The long chain alcohol residues improves the solubility of the prepolymer in nonpolar solvents.

The isocyanate component is prepared by reacting a diisocyanate and a

Serial No. 08/702,625

Art Unit: 1207

monohydroxy C₁₀₋₅₀ alcohol in the presence of an isocyanuration catalyst to form the prepolymer and removing the unreacted diisocyanate by a distillation process. The isocyanurate can be formed from the diisocyanate alone, the unreacted diisocyanate removed and the isocyanurate reacted with a C₁₀₋₅₀ monohydroxy alcohol.

The isocyanurate of Minato et al. is used in a two component system and is particularly soluble in non polar solvents.

The Minato et al. composition is taught as useful in two component systems in coatings, adhesives, architectural materials, molding materials and the like. There is neither teaching nor suggestion that the isocyanurate composition of Minato et al. would be useful in a one component foam forming composition. Use of the Minato et al. composition as a coating composition would suggest that the prepolymer composition would not be useful in a foaming composition.

Appellants submit that as disclosed in Canada and Minato et al., it is known in the art to prepare polyisocyanate containing compositions with a low content of diisocyanate monomer. However, these compositions are known for use in lacquers or adhesives. Lacquers and adhesives are relatively expensive materials which can afford the extra process steps in preparing the low diisocyanate monomer material. However, there would be no incentive for one skilled in the art to include the expensive low diisocyanate content, slow reacting prepolymer material in a system for forming a foamed resin comprising the container of Pauls from which virtually all of the contents are expelled, to reduce the expense of disposing of the container.

Appellants respectfully submit that the combination of Pauls with Canada and Minato et al. does not provide a prima facie case of obviousness on which a rejection under 35 U.S.C. 103(a) can be based. Appellants submit that the combination of references neither teaches nor suggests the present invention.

THE COMBINATION OF REFERENCES IS IMPROPER

Appellants respectfully submit that the rejection over the combination of Pauls in view of Canada and Minato et al. is improper. To formulate a rejection over a combination of references there must be some suggestion or incentive in the combination of references to make the combination. As discussed above, the only suggestion to combine the teachings of the references is in the present application. Clearly, one skilled in the art would not be led to include a low diisocyanate monomer content prepolymer in the container of Pauls, since the single component foaming mixture is virtually completely expelled from the container and the empty container would not present a disposal problem.

Appellants have provided a novel and unobvious system for providing a plastic foam. The system has a major unrecognized advantage in disposal of the empty container. Applicants submit that the prior art cited by the examiner provides no teaching or suggestion of the system of the invention. Pauls teaches the known system for forming foams; Canada and Minato et al. discloses low monomer content materials used for coatings and adhesives. There is no suggestion or incentive to combine the teachings of the references or that the low diisocyanate containing prepolymers for use in

two component system of Canada and Minato et al. would be useful as a one component foam forming system.

The combination of Pauls with Canada and Minato et al. is deficient in neither teaching nor suggesting that isocyanurates or polymeric MDI be utilized as the polyisocyanate in a one component polyurethane foam forming system. There is no teaching or suggestion that low monomer polyisocyanates and polymeric MDI are suitable foaming agents for one component foam systems. There is neither teaching nor suggestion that the slow reacting coating compositions of Canada and Minato et al. could meet the requirements of fast reaction of a foam forming system. The combination of references could only be considered as a suggestion to try without any assurances of success.

In view of the above, Appellants submit that the present invention is neither taught nor suggested by the combination of Pauls, Canada and Minato et al. and request that the Examiner's rejection be reversed.

Appellants also submit that use of a low diisocyanate monomer content prepolymer is only one possible solution to the problem addressed by the system of the present invention.

Disposable containers for generating foam plastic have been known for many years. However, the prepolymers utilized in the known systems were formed by mixing a large excess of the diisocyanate with OH terminated diols in the container to form a useful prepolymer. However, since the compositions require a large stoichiometric

Serial No. 08/702,625

Art Unit: 1207

excess of the diisocyanate, the known foam forming compositions contained high concentrations of unreacted diisocyanate monomer. The present invention provides a system for forming a foam which provides for residues with low monomer content in the pressurized container after use. The container can be designed to introduce an isocyanate cyclotrimer (isocyanuration) catalyst into the composition immediately before, during or after the contents have been removed from the container or introducing a low molecular weight alcohol into the container after the foam producing contents have been expelled form the container. Trimerization catalyst or the alcohol provide reactions which remove the diisocyanate monomer from contents of the container.

Systems for producing foamed plastics from pressurized containers were well known at the time the present invention was made. However, the systems were not concerned with residual amounts of unreacted diisocyanate monomers in the pressurized container. The systems all contained substantial amounts of unreacted diisocyanate monomer in the container or the container was designed to expel substantially the entire contents of pressurized container (Pauls) so that there was little or no diisocyanate monomer remaining in the pressurized container.

PATENTABILITY OF THE CLAIMS

Claim 15

Claim 15 is patentable over the combination of references since there is neither

teaching nor suggestion of a disposable pressurized container for forming a foam containing a polyisocyanate or isocyanate prepolymer having an NCO content of from 8% to 30% by weight based on the prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, which contains less than 5% by weight of an isocyanate monomer one day after the container is emptied. The compositions disclosed in Pauls contain more than 5% by weight isocyanate monomer and the compositions of Canada and Minato et al. are not disclosed or suggested as useful for foams. There is no suggestion to combine the references.

Claim 16

Claim 16 is patentable over the combination of references since the combination of references neither teaches nor suggests the system of claim 15 wherein the residue in the container after use has diisocyanate monomer content of less than 2% by weight based on the total contents of the container after use nor suggests that it would be useful to provide such a system. As discussed above, there is no suggestion to combine the reference and no assurance that the low monomer content prepolymer of Canada and Minato et al. would be useful foam form compositions.

Claim 17

Claim 17 is patentable over the combination of references since there is neither teaching nor suggestion of a composition comprising the isocyanate polymer or prepolymer, catalyst, blowing agent and foam stabilizer with a diisocyanate monomer

Serial No. 08/702,625

Art Unit: 1207

content less than 2% by weight based on the total contents of the container before application of the composition. There is neither teaching or suggestion to combine the lacquer components of Canada or Minato et al. in the composition and container of Pauls or that such a composition would have useful foam forming properties.

Claims 18, 19, 20 and 21

Claims 18, 19, 20 and 21 are patentable over the combination of references since there is neither teaching nor suggestion of a system as claimed in claim 15 containing isocyanate polymer or prepolymer having from 8 to 30% by weight of NCO groups, based on the weight of the prepolymer, and a diisocyanate monomer content within the ranges set forth in claims 18-21. There is no teaching or suggestion that the slow reacting prepolymers of Canada or Minato et al. would be useful as a foam forming composition with its requirement for rapid curing.

Claim 22

Claim 22 is not obvious over the combination of references since there is neither teaching nor suggestion of the system containing a polyisocyanate or isocyanate prepolymer with an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa·s at 25° centigrade produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and /or aromatic diisocyanates containing 8 to 20 carbon atoms and a diisocyanate monomer content of less than 3% by weight based on the prepolymer.

Claim 23

Claim 23 is patentable over the teachings of the combination of references since there is neither teaching nor suggestion of the system of the invention wherein the prepolymer with the low NCO content be a cyclotrimer of a diisocyanate. Isocyanurates are known but until the present invention had not been applied to one component foaming systems.

Claim 24

Claim 24 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein the prepolymer is a cyclotrimer of hexamethylene diisocyanate, isophorone diisocyanate and mixed trimers of hexamethylene diisocyanate and isophorone diisocyanate. These isocyanurates had never been applied to foaming systems before the present invention.

Claim 25

Claim 25 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein an isocyanate prepolymer is a prepolymer of diisocyanates or isocyanurates with polyols and containing from 8 to 30% by weight of the prepolymer of NCO groups.

Claim 26

Claim 26 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention containing a prepolymer containing from 8 to 30% by weight of NCO groups based on the weight of the

Serial No. 08/702,625

Art Unit: 1207

prepolymer wherein the prepolymer is produced from diisocyanates with NCO groups differing in their reactivity.

Claim 27

Claim 27 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the present invention comprising a pressurized container containing from 50 to 90% by weight of at least one polyisocyanate or isocyanate prepolymer containing from 8 to 30% by weight of the prepolymer of NCO groups, 0.1 to 5% by weight of a catalyst for reaction of the isocyanate groups with OH groups, 5 to 35% by weight of a blowing agent and 0.1 to 5% by weight of a foam stabilizer which after the container is empty contains less than 5% by weight of the contents of the container of diisocyanate monomer.

Claim 28

Claim 28 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising a polyisocyanate or isocyanate prepolymer containing from 26 to 30% by weight based on the weight of the prepolymer of NCO groups, a functionality greater than 2.7 wherein the prepolymer is formed from technical MDI by removal of a portion of diisocyanatodiphenylmethane. MDI prepolymer had not been applied to one component foaming system before the present invention. In addition, the prior art cited does not teach or suggest a foaming prepolymer with a content of NCO groups of 26-30% by weight of the prepolymers.

Claim 29

Claim 29 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising use of polymer MDI or a polymer MDI prepolymer with an NCO content of from 26 to 30% by weight of the prepolymer.

Claim 30

Claim 30 is patentable over the combination of references since there is neither teaching nor suggestion of the system claimed in claim 29 where the polymer MDI prepolymer is formed by reaction of MDI with a diol containing 2 to 6 carbon atoms.

Claim 31

Claim 31 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention whereby the system comprises polymer MDI or polymer MDI prepolymer having from 26 to 30% by weight of NCO groups wherein up to 50% by weight of the polymer MDI or polymer MDI prepolymer is replaced by at least one member selected from a group consisting of low-monomer NCO prepolymers of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms.

Claim 32

Claim 32 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention for replacing a portion of the polymer MDI or polymer MDI prepolymer to produce moisture-curing foams differing in

Serial No. 08/702,625

Art Unit: 1207

their hardness and elasticity.

Claim 33

Claim 33 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising the composition disclosed in claim 33 wherein the polymer MDI or polymer MDI prepolymer has an NCO content of from 26 to 30% by weight of the prepolymer.

Claim 34

Claim 34 is patentable over the combination of references since there is neither teaching nor suggestion of the one-component foam plastic produced by the system of the present invention.

Claim 35

Claim 35 is patentable over the combination of references since there is neither teaching nor suggestion of the one-component foam plastic of the system of the invention used as an insulating or assembly foam.

Claim 36

Claim 36 is patentable over the combination of references since the combination of references is silent concerning a one-component foam plastic formed in situ by the system of the invention.

Claim 40

Claim 40 is patentable over the combination of references since there is no teaching nor suggestion of a composition comprising at least one polyisocyanate or

Serial No. 08/702,625

Art Unit: 1207

isocyanate prepolymer having an NCO content of from 8 to about 30% by weight based on the weight of the prepolymer, a catalyst for the reaction of the isocyanate group and an OH group, a blowing agent and a foam stabilizer and providing the residue in the spent container as claimed.

Claim 41

Claim 41 is patentable over the combination of references since there is neither teaching nor suggestion of the composition of Claim 40 having a residue with a diisocyanate monomer content of less than 2% by weight based on the total weight of the contents of the container.

Claim 42

Claim 42 is patentable over the combination of references since there is neither teaching nor suggestion of a composition wherein the diisocyanate monomer content is less than 2% by weight based on the total contents of the container before its application and the isocyanate polymer or isocyanate polymer prepolymer contains from 8 to 30% by weight of NCO groups by weight of the prepolymer.

Claim 43

Claim 43 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for use in the system of the invention containing isocyanate polymer or isocyanate polymer prepolymer containing from 8 to 30% by weight of NCO groups in the composition having less than 1% by weight diisocyanate monomer based on the weight of the composition.

Claim 44

Claim 44 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for the system of the invention containing less than 1.0% by weight of diisocyanate monomer before the foam issues from the container.

Claim 45

Claim 45 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for use in the system of the invention comprising isocyanate polymers or isocyanate polymer prepolymers containing from 26 to 30% by weight of NCO groups, catalysts, foaming agents, foam stabilizers wherein the diisocyanate monomer content of the composition is less than 0.5% by weight.

Claim 46

Claim 46 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising a composition containing the catalyst, foaming agent, foam stabilizer and an isocyanate polymer or isocyanate prepolymer having from 8% to 30% by weight of NCO groups and less than 0.5% by weight of diisocyanate monomer, based on the total contents of the composition before application of composition from the disposable pressurized container.

Claim 47

Claim 47 is patentable over the combination of references since there is neither

Serial No. 08/702,625

Art Unit: 1207

teaching nor suggestion of a composition for forming a foam plastic from the disposable pressurized container system of the invention wherein the polyisocyanate or isocyanate prepolymer has a diisocyanate monomer content of less than 3% by weight based on the weight of the prepolymer, an NCO functionality of 2 to 5, NCO content of 8 to 30% by weight based on the weight of the prepolymer, a viscosity from 5 to 200 Pa·s at 25° centigrade wherein the prepolymer is produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and/or aromatic diisocyanates containing 8 to 20 carbon atoms each with a boiling point not higher than 180°C at 10 mbar.

Claim 48

Claim 48 is patentable over the combination of references since there is neither teaching nor suggestion of use of an isocyanate prepolymer which is a cyclotrimer of a diisocyanate in the system of the invention for forming a plastic foam.

Claim 49

Claim 49 is patentable over the combination of references since there is neither teaching nor suggestion of a composition wherein the isocyanate is a polymer selected from the group consisting of cyclotrimers of hexamethylene diisocyanate, cyclotrimers of isophorone diisocyanate and mixed trimers thereof for use in a foam forming system of the invention.

Claim 50

Serial No. 08/702,625

Art Unit: 1207

Claim 50 is patentable over the combination of references since there is neither teaching nor suggestion of the polymer isocyanate prepolymer formed from diisocyanate or polyisocyanate and polyols for use in the foam forming system of the invention or for any foam forming system.

Claim 51

Claim 51 is patentable over the combination of references since there is neither teaching nor suggestion for forming the isocyanate prepolymers from diisocyanates containing NCO groups with different reactivities to achieve a low diisocyanate monomer content for the foam forming system of the invention or for any foam forming system.

Claim 52

Claim 52 is patentable over the combination of references since there is neither teaching nor suggestion of the composition containing 50 to 90% by weight of the polyisocyanate or isocyanate prepolymer, 0.1 to 5% by weight of a catalyst, 5 to 35% by weight of blowing agent and 0.1 to 5% by weight of a foam stabilizer wherein the polyisocyanate or isocyanate prepolymer has an NCO content of from 8 to 30% by weight of the prepolymer for use in the system of the invention. Wherein the pressurized container has less than 5% by weight of diisocyanate monomer in the contents of the container one day after the container has been emptied.

Claim 53

Claim 53 is patentable over the combination of references since the references

Serial No. 08/702,625

Art Unit: 1207

are completely silent concerning polyisocyanates or isocyanate prepolymer formed from polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight based on the polymer-MDI, an average NCO functionality greater than 2.7, an NCO content of 26 to 30% by weight based on the polymer-MDI with a viscosity of 5 to 2000 Pa · s at 25° centigrade a polymer-MDI obtained from technical MDI with an average functionality greater than 2.3 by removal of diisocyanatodiphenyl-methane for use in the system of the invention.

Claim 54

Claim 54 is patentable over the combination of references since there is neither teaching nor suggestion of the composition wherein at least one polymer MDI or polymer-MDI prepolymer is a prepolymer formed from a polymer-MDI and a polyol for use in the system of the invention.

Claim 55

Claim 55 is patentable over the combination of references since there is neither teaching nor suggestion of the composition wherein the polyol is a diol containing 2 to 6 carbon atoms for use in the system of the invention.

Claim 56

Claim 56 is patentable over the combination of references since there is neither teaching nor suggestion of a polymer-MDI or polymer-MDI prepolymer containing at least one low-monomer NCO prepolymer comprising residues of at least one member selected from the group consisting of hexamethylene diisocyanate, tolylene-2,6-

Serial No. 08/702,625
Art Unit: 1207

isocyanate, isophorone diisocyanate, diphenylmethane 4,4'-diisocyanate and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms for use in the system of the invention.

Claim 57

Claim 57 is patentable over the combination of references since there is neither teaching nor suggestion that replacing a portion of the polymer MDI or polymer MDI prepolymer produces moisture-curing foams differing in their hardness and elasticity.

Claim 58

Claim 58 is patentable over the combination of references since there is neither teaching nor suggestion of the composition of claim 58 wherein the polymer MDI or polymer MDI prepolymer contains from 26 to 30% by weight of NCO groups and the remaining components of the composition.

Claim 59

Claim 59 is patentable over the combination of references since there is neither teaching nor suggestion of cured foam plastic of the invention.

Claim 60

Claim 60 is patentable over the combination of references since there is neither teaching nor suggestion concerning foam plastics of the system of the invention and their possible use as an insulating or assembly material.

Claim 61

Claim 61 is patentable over the combination of references since there is neither

Serial No. 08/702,625

Art Unit: 1207

teaching nor suggestion of the system of the invention and one-component foamed plastic used in situ which has the composition set forth in claim 40.

Claim 62

Claim 62 is patentable over the combination of references since there is neither teaching nor suggestion of a two-component foam plastic obtained from the compositions claimed in claim 40 by reaction of the composition thereof and a polyol.

Claim 63

Claim 63 is patentable over the combination of references since there is neither teaching nor suggestion for using the two-component foam plastic of claim 62 as an insulating or assembly foam.

Claim 64

Claim 64 is patentable over the combination of references since the combination of references neither teaches nor suggests a two-component foam plastic used in situ formed from the composition of claim 40 for use in the system of the invention. The references which utilize two component mixtures do not suggest the mixtures as useful for forming foams.

Claim 65

Claim 65 is patentable over the combination of references since there is neither teaching nor suggestion of a composition having an NCO group content of from 8 to 30% by weight and wherein the at least one polyisocyanate or isocyanate prepolymer with the low diisocyanate monomer content is obtained by distilling the diisocyanate

monomer from the polyisocyanate or isocyanate prepolymer.

Claim 66

Claim 66 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein a trimerization catalyst is introduced into the composition in the container immediately before or after the foam is released from the container.

Claim 67

Claim 67 is patentable over the combination of references since there is neither teaching nor suggestion of the system of claim 15 wherein the diisocyanate monomers are reacted with an OH compound added to the composition in the disposable pressurized container after a foaming period.

Claim 68

Claim 68 is patentable over the combination of references since there is neither teaching nor suggestion of the system of claim 15 wherein a monohydroxy alcohol is added to the composition remaining in the disposable pressurized container of the system after the foam is released.

Appellants respectfully submit that the claims as presently in the application are neither anticipated nor obvious over the teachings the combination of Pauls, Canada and Minato et al. whether they are considered alone or in combination since they neither teach nor suggest:

1. A system which comprises a pressurized container, a particular

Serial No. 08/702,625

Art Unit: 1207

isocyanate polymer or isocyanate polymer prepolymer having from 8 to 30% by weight of NCO groups based on the weight of the prepolymer, a catalyst for a reaction with an OH compound, a foaming agent, and a foam stabilizer and having a diisocyanate monomer content less than 5% by weight of the contents of the container one day after the container is emptied.

2. An isocyanate polymer or isocyanate polymer prepolymer having an NCO content of 26 to 30% by weight of the prepolymer.

3. The system of the invention comprising prepolymers prepared from diisocyanate trimers or prepolymers prepared from the diisocyanate trimers having less than 5% by weight of diisocyanate monomer.

4. The system of the invention comprising polymer MDI or polymer MDI prepolymers as the foam forming material.

Appellants submit that a rejection of the claims in the present application based on the teachings of Pauls, Canada and Minato et al. is untenable and respectfully request that the Honorable Board of Appeals and Interferences reverse the Examiner.

SUMMARY

Appellants respectfully request that the Examiner's final rejection be reversed for the following reasons:

1. The combination of Pauls in view of Canada and Minato et al. fails to teach or suggest the system of the invention.
2. The combination of Pauls in view of Canada and Minato et al. is

Serial No. 08/702,625

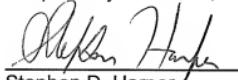
Art Unit: 1207

improper since the only suggestion to combine the teaching of the references is in the present application.

3. The isocyanate product disclosed in Canada is not suitable for use as a material for forming a foam plastic since the isocyanate is a slow reacting solid.

In view of the above discussion, Appellants respectfully request that the final rejection be reversed.

Respectfully submitted,



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APPENDIX

CLAIMS ON APPEAL

15. A system for the production of plastic foam comprising: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or isocyanate prepolymer having an NCO content of from about 8% to about 30% by weight based on the prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of the plastic foam from said disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5.0% by weight, based on the residual contents of the emptied container.
16. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight based on the total contents of the container.
17. The system as claimed in claim 16 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.
18. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight based on the total contents of the container.
19. The system as claimed in claim 18 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight based on the total contents of the container before its application from said disposable pressurized container.

20. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight based on the total contents of the container.
21. The system as claimed in claim 20 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight based on the total contents of the container before application of the composition from said disposable pressurized container.
22. The system as claimed in claim 15 wherein said composition contains, before its application from said disposable pressurized container, as said at least one polyisocyanate or isocyanate prepolymer, at least one isocyanate prepolymer with a diisocyanate monomer content of less than 3.0% by weight, based on the prepolymer, an NCO functionality of 2 to 5, an NCO content of 8 to 30% by weight, based on the prepolymer, and a viscosity of 5 to 200 Pa · s at 25°C, as measured in accordance with DIN 53015, the prepolymer having been produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and aromatic diisocyanates containing 8 to 20 carbon atoms, each with a boiling point not higher than 180°C at 10 mbar.
23. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a cyclotrimer of a diisocyanate.
24. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a cyclotrimer of a mixture of hexamethylene diisocyanate, isophorone diisocyanate, and mixed trimers thereof.

Serial No. 08/702,625

Art Unit: 1207

25. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a prepolymer of diisocyanates or isocyanurates containing NCO groups and polyols.
26. The system as claimed in claim 22 wherein said prepolymer has been produced from diisocyanates with NCO groups differing in their reactivity.
27. The system as claimed in claim 15 wherein said composition is comprised of:
 - 50 to 90 % by weight of said at least one polyisocyanate or isocyanate prepolymer,
 - 0.1 to 5.0 % by weight of said catalyst,
 - 5 to 35 % by weight of said blowing agent, and
 - 0.1 to 5.0 % by weight of said foam stabilizer.
28. The system as claimed in claim 15 wherein said at least one polyisocyanate or isocyanate prepolymer is at least one polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight, based on the polymer-MDI, an average NCO functionality of greater than 2.7, an NCO content of 26.0 to 30.0% by weight, based on the polymer-MDI, and a viscosity of 5 to 2,000 Pa · s at 25°C according to DIN 53015, the polymer-MDI being obtained from technical MDI with an average functionality of greater than 2.3 by removal of a portion of the diisocyanatodiphenylmethane.
- 29.(Amended) The system as claimed in claim 28 wherein said at least one polymer-MDI or polymer-MDI prepolymer is a prepolymer of the polymer MDI and a polyol.
30. The system as claimed in claim 29 wherein said polyol is a diol containing 2 to 6 carbon atoms.
31. The system as claimed in claim 28 wherein up to 50% by weight of said at least one

Serial No. 08/702,625

Art Unit: 1207

polymer-MDI or polymer-MDI prepolymer is replaced by at least one member selected from the group consisting of low-monomer NCO prepolymers of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate, and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms.

32. The system as claimed in claim 31 wherein said replacing produces moisture-curing foams differing in their hardness and elasticity.

33. The system as claimed in claim 28 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polymer-MDI or polymer-MDI prepolymer,

0.1 to 5.0 % by weight of the catalyst,

5 to 35 % by weight of the blowing agent, and

0.1 to 5.0 % by weight of the foam stabilizer.

34. A one-component foam plastic obtained from the system claimed in claim 15 by reaction of the composition thereof and moisture.

35. The method of using a one-component foam plastic as claimed in claim 34 wherein said one-component foam plastic is used as an insulating or assembly foam.

36. The method as claimed in claim 35 wherein said one-component foam plastic is used in situ.

40. A composition for the production of foam plastics from disposable pressurized containers comprising at least one polyisocyanate or isocyanate prepolymer having an NCO content of from about 8% to about 30% by weight based on the prepolymer, at least

one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of the composition from said disposable pressurized container, the residue of said composition left in the pressurized container has a diisocyanate monomer content of less than 5.0% by weight, based on the residual contents of the emptied container.

41. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 2.0% by weight based on the total contents of the container.
42. The composition as claimed in claim 41 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.
43. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 1.0% by weight based on the total contents of the container.
44. The composition as claimed in claim 43 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight , based on the total contents of the container before application of the composition from said disposable pressurized container.
45. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 0.5% by weight based on the total contents of the container.
46. The composition as claimed in claim 45 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight , based on the total contents of the container before application of the composition from said disposable pressurized container.
47. The composition as claimed in claim 40 wherein said composition contains, before

application from said disposable pressurized container, as said at least one polyisocyanate or isocyanate prepolymer, at least one isocyanate prepolymer with a diisocyanate monomer content of less than 3.0% by weight, based on the weight of the prepolymer, an NCO functionality of 2 to 5, an NCO content of 8 to 30% by weight, based on the weight of the prepolymer, and a viscosity of 5 to 200 Pa · s at 25°C, as measured in accordance with DIN 53015, the prepolymer having been produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and aromatic diisocyanates containing 8 to 20 carbon atoms, each with a boiling point not higher than 180°C at 10 mbar.

48. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is a cyclotrimer of a diisocyanate.
49. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is at least one isocyanate prepolymer selected from the group consisting of cyclotrimer of hexamethylene diisocyanate, cyclotrimer of isophorone diisocyanate, and mixed trimers thereof.
50. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is a prepolymer of at least one of diisocyanates and isocyanurates and polyols.
51. The composition as claimed in claim 47 wherein said prepolymer has been produced from diisocyanates with NCO groups differing in their reactivity.

Serial No. 08/702,625

Art Unit: 1207

52. The composition as claimed in claim 40 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polyisocyanate or isocyanate prepolymer,

0.1 to 5.0 % by weight of said catalyst,

5 to 35 % by weight of said blowing agent, and

0.1 to 5.0 % by weight of said foam stabilizer.

53. The composition as claimed in claim 40 wherein said at least one polyisocyanate or isocyanate prepolymer is at least one polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight, based on the polymer-MDI, an average NCO functionality of greater than 2.7, an NCO content of 26.0 to 30.0% by weight, based on the polymer-MDI, and a viscosity of 5 to 2,000 Pa · s at 25°C according to DIN 53015, the polymer-MDI being obtained from technical MDI with an average functionality of greater than 2.3 by removal of the diisocyanatodiphenylmethane.

54. The composition as claimed in claim 53 wherein said at least one polymer-MDI or polymer-MDI prepolymer is a prepolymer of the polymer MDI and a polyol.

55. The composition as claimed in claim 54 wherein said polyol is a diol containing 2 to 6 carbon atoms.

56. The composition as claimed in claim 53 wherein up to 50% by weight of said at least one polymer-MDI or polymer-MDI prepolymer is replaced by at least one low-monomer NCO prepolymer comprising residues of at least one member selected from the group consisting of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate, and cyclotrimers of aliphatic

Serial No. 08/702,625

Art Unit: 1207

diisocyanates containing 4 to 14 carbon atoms.

57. The composition as claimed in claim 56 wherein said replacing produces moisture-curing foams differing in their hardness and elasticity.

58. The composition as claimed in claims 53 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polymer-MDI or polymer-MDI prepolymer,

0.1 to 5.0 % by weight of the catalyst,

5 to 35 % by weight of the blowing agent, and

0.1 to 5.0 % by weight of the foam stabilizer.

59. A one-component foam plastic obtained from the composition claimed in claim 40 by reaction of the composition thereof and moisture.

60. The method of using a one-component foam plastic as claimed in claim 59 wherein said one-component foam plastic is used as an insulating or assembly foam.

61. The method as claimed in claim 60 wherein said one-component foam plastic is used in situ.

62. A two-component foam plastic obtained from the composition claimed in claim 40 by reaction of the composition thereof as a first component and a polyol as a second component.

63. The method of using a two-component foam plastic as claimed in claim 62 wherein said two-component foam plastic is used as an insulating or assembly foam.

64. The method as claimed in claim 63 wherein said two-component foam plastic is used in situ.

Serial No. 08/702,625

Art Unit: 1207

65. A method of producing the system as claimed in claim 15 wherein diisocyanate is distilled from said at least one polyisocyanate or isocyanate prepolymer.
66. A method of producing the system as claimed in claim 15 wherein diisocyanate monomers are polymerized by addition of trimerization catalysts immediately before or after foaming.
67. A method of producing the system as claimed in claim 15 wherein diisocyanate monomers are reacted with an OH compound added to the composition remaining in the disposable pressurized container after foaming.
68. The method as claimed in claim 67 wherein said OH compound is a monoalcohol.

Serial No. 08/702,625
Art Unit: 1207

EVIDENCE APPENDIX

None

Serial No. 08/702,625

Art Unit: 1207

RELATED PROCEEDINGS APPENDIX

None